205105 - Tools for Decision Making

Coordinating unit:	205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit:	732 - OE - Department of Management
Academic year:	2019
Degree:	MASTER'S DEGREE IN TECHNOLOGY AND ENGINEERING MANAGEMENT (Syllabus 2016). (Teaching unit Compulsory)
ECTS credits:	7,5 Teaching languages: English

Teaching staff

Coordinator:	JOSE MARIA SALLAN LEYES
Others:	Primer quadrimestre: ORIOL LORDAN GONZALEZ - 1

Degree competences to which the subject contributes

Basic:

CB6. Knowledge and understanding that provides a basis or opportunity for originality in the development and/or application of ideas, often in a research context.

CB7. METMF_The ability to apply the knowledge and problem-solving skills acquired in new or unfamiliar environments within wider (or multidisciplinary) contexts related to the area of study.

CB8. METMF_The ability to integrate knowledge and deal with the complexity of making judgements on the basis of information that, albeit incomplete or limited, includes thoughts on the role played by social and ethical responsibility in the application of knowledge and judgement.

CB9. METMF_The ability to communicate conclusions, and the knowledge and reasons that ultimately sustain these conclusions, to specialised and lay audiences in a clear and unambiguous way.

CB10-METP. Learning abilities that will enable students to keep studying in a largely self-directed or independent manner.

Specific:

CE02-MEM. The ability to analyse data for pattern recognition.

CE03-MEM. The ability to optimise problems and systems using mathematical models and make decisions in conditions of uncertainty.

CE04-MEM. The ability to apply theoretical and fundamental principles of technology and engineering business management in conditions of uncertainty.

Transversal:

CT1a. ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding how companies are organised and the principles that govern their activity, and being able to understand employment regulations and the relationships between planning, industrial and commercial strategies, quality and profit.

CT2. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

CT3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

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Teaching methodology

Lecture: Lecturers present concepts, principles and techniques, with the active participation of students.
Problem Based Learning: Lecturers and students resolve exercises and standard problems through specific techniques related to the theoretical contents and principles of the course.
Project Based learning: Students resolve complex problems through specific techniques related to the theoretical contents and principles of the course.
Self-study: Students diagnose their learning needs, in collaboration with the lecturers, and plan their own learning process.

Learning objectives of the subject

The course Tools for Decision Making introduces students to the concepts, principles and techniques of data analysis, linear programming, integer-mixed linear programming, and Markov chains for making smart and successful decisions in different contexts.

Study load

Total learning time: 187h 30m			
	Hours large group:	30h	16.00%
	Hours medium group:	30h	16.00%
	Self study:	127h 30m	68.00%

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Content

Module 1: Data Analysis	Learning time: 67h 30m
	Theory classes: 10h Practical classes: 10h Self study : 47h 30m

Description:
The goal of this module is to identify relationships between variables that are particularly interesting or unexpected, to check if there is any evidence for or against a stated hypothesis, to check for problems with the collected data, such as missing data or measurement error, or to identify certain areas where more data need to be collected.
Getting Started with R
Managing Data Frames
Data Analysis Checklist
Principles of Analytic Graphics
Exploratory Graphs
Clustering Analysis
Plotting and Color in R

Related activities:
Distance and in-class activities
Group project
Final exam
Online self-Assessment

Module 2: Linear Programming	Learning time: 60h
	Theory classes: 10h Practical classes: 10h Self study : 40h

Description:
The goal of this module is to model industrial and service situations (problems about production, logistics, marketing, finance and human resources) through linear programming, to resolve them using different software, such as R, and to take efficient decisions from the results of the models.

Introduction to Quantitative Methods
Fundamentals of Linear Programming
Types of Linear Programming Models
Duality and Sensitivity Analysis
Integer and Mixed Linear Programming

Related activities:
Distance and in-class activities
Final exam
Online self-Assessment

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Module 3: Markov Chains	Learning time: 60h
	Theory classes: 10h Practical classes: 10h Self study : 40h

Description:
The goal of this module is to model industrial and service situations (problems about production, logistics, marketing, finance and human resources) through Markov Chains, to resolve them using different software, such as R, and to take efficient decisions from the results of the models.

Introduction to Markov chains
Simple Markov chains
Reward Markov chains
Reward Markov chains with decision
Dynamic Programming

Related activities:
Distance and in-class activities
Final exam
Online self-Assessment

Qualification system

The final grade depends on the following three elements:

* 30%, Distance and in-class activities (any activity will have a weight greater than 5%)
* 40%, Group project (report and dissertation)
* 30%, Final exam
For those students who meet the requirements and submit to the reevaluation examination, the grade of the reevaluation exam will replace the grades of all the on-site written evaluation acts (tests, midterm and final exams) and the grades obtained during the course for lab practices, works, projects and presentations will be kept.
If the final grade after reevaluation is lower than 5.0, it will replace the initial one only if it is higher. If the final grade after reevaluation is greater or equal to 5.0, the final grade of the subject will be pass 5.0.

Bibliography

Universitat Politècnica de Catalunya